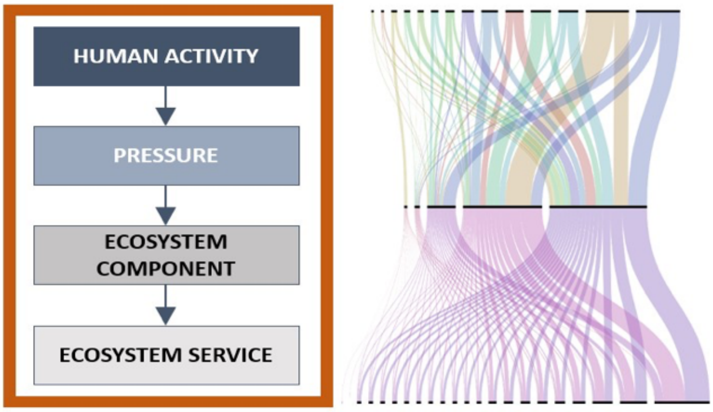
10

Tools: Linkage Framework



The AQUACROSS Linkage Framework is a method to support the application of ecosystem-based management (EBM) in aquatic ecosystems. Human wellbeing relies on many different ecosystem services, such as food provision from fish, wastewater bioremediation, and cultural recreation. These services rely on different parts of the ecosystem to supply them. In turn, the services are often actively exploited by human activities.

If we want to manage ecosystem services sustainably, we need to understand how the state of the ecosystem affects their supply, and how human activities can affect the state of the ecosystem. The linkage framework, around which the AquaLinks tool was built was built (see "AQUALINKS Tool"), helps us with this by encompassing the interactions between human activities and ecosystem services. It accounts for the pressures that are being introduced by human activities and that can impact ecosystem state. Changes in ecosystem state can then affect the supply of services through altered ecosystem functioning. The Framework's integrative approach is important when it comes to considering these interactions because different activities can introduce the same pressures, and multiple ecosystem services can be supplied by the same parts of the ecosystem. Thus, by managing one activity, the key pressures are not necessarily removed, because other unmanaged activities could still be introducing these pressures. In addition, focusing on protecting one specific ecosystem service could result in the loss of multiple others.

IMPLEMENTATION

The steps of implementing this approach are:

1. Identify all the relevant activities, pressures, ecosystem components and ecosystem services that are relevant for the system. The typologies developed in AQUACROSS can be a useful starting point for this (see Integrative environmental policy objectives).

2. Identify the connections between all of these elements. This requires expertise and evidence of the system you are working in. Once this has been carried out, the output is already useful as a description of the system and can be analysed

3. Identify the importance of different links (the weighting). This requires expertise and careful cross checking for consistency. The output of this will allow a prioritisation for management. This can be done for the impact risk to the ecosystem, the service supply capacity of the ecosystem and the risk to the supply of services.

VALUE OF THE PRACTICAL APPLICATION OF THE LINKAGE FRAMEWORK TO SUPPORT EBM

The linkage framework provides valuable information for policy makers and environmental managers on how human activities and pressures affect ecosystems, their services and biodiversity, through to the capacity of aquatic ecosystems to continue providing the services society depends on.

Visualise the system: identifying all relevant human activities, pressures, ecosystem components and services to describe how society and nature are linked.

Integrative perspective of the system: a crucial element in EBM approaches is the involvement of stakeholders. In terms of communication, the linkage framework can support targeted stakeholder dialogue as it helps to conceptually describe the complex interactions of social-ecological systems, advancing from narrow single sector views or single pressure-effect approaches.

Prioritise management: e.g. identify the key activities to manage, or key services at risk, but also consider these in the context of the entire system, such as identifying all ecosystem services that might be affected, and all activities that might need to be managed.

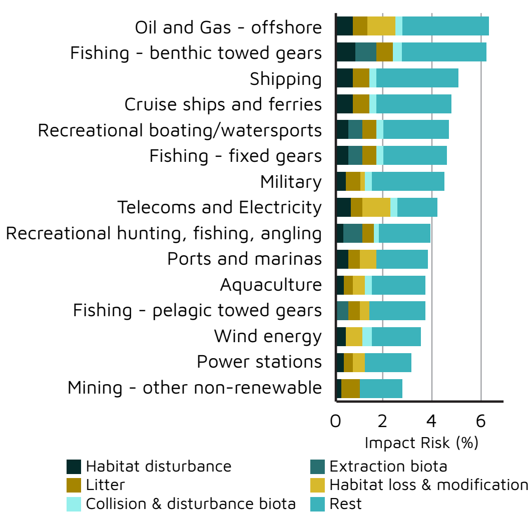
Links to EU policy objectives: Ecosystem components are linked to environmental objectives, e.g. Good Environmental Status of seabed habitats, or Good Ecological Status of benthic invertebrates. Activities and pressures also link to policies such as the Renewable Energy Strategy e.g. hydropower. The linkage framework can help to identify links with policies that do not directly consider aquatic biodiversity. Identifying these links can help to highlight potential synergies or trade-offs of environmental and/or economic policies.

AQUACROSS produced comprehensive guidance for transferring this work to support real assessments in aquatic ecosystems and related land-water transitional regions. Guidance available allows users to integrate and reflect the complexity of their own systems' social-ecological interactions, namely by:

- Identifying 'Activities' with associated 'Pressures' that facilitate selection of specific indicators. As additional support, in the absence of local data, an expert-based semi-quantitative characterisation of 'Activities' and 'Pressures' and their potential effects on 'Ecosystem Components' is also available for use as an alternative to data-based indicators.
- Identifying Biodiversity 'Ecosystem Components', 'Ecosystem Functions', and 'Ecosystem Services' and how to link specific indicators to the most suitable classifications. As additional support, in the absence of data-based indicators for assessing 'Ecosystem services', a Service Supply Potential for targeted ecosystem components can be used as a proxy of ecosystem services at risk.

EXAMPLE CASE STUDY – NORTH SEA

The North Sea is heavily used by humans and many sectors lay claim to limited resources. Some of the human activities introducing pressures into this ecosystem include fishing, shipping, oil and gas extraction, and newly emerging activities such as the renewable energy sector (see Case Study: North Sea). As an example of the results from the AQUACROSS linkage framework, the figure shows the main human activities and the pressures they cause, in terms of the impact risk they introduce to the system.



Impact risk for the activities in the North Sea case study (15 most relevant activities)

← Go to Brief #9: Evaluating EBM

www.aquacross.eu/results

Go to Brief #11: Information Platform →

Further information

This is one of 38 short briefs summarising the key results of the AQUACROSS Project. For more detailed information on the topics covered in this brief, see the following:

- Teixeira, H., Lillebo, A.I., Culhane, F., Robinson, L., Trauner, D., Borgwardt, F., Kummerlen, M., Barbosa, A., McDonald, H., Funk, A., O'higgins, T., Van der Wal, J.T., Piet, G., Hein, T., Arévalo-Torres, J., Iglesias-Campos, A., Barbière, J., Nogueira, A.J.A., 2019. Linking biodiversity to ecosystem services supply: Patterns across aquatic ecosystems. Science of The Total Environment 657, 517–534. doi:10.1016/j.scitotenv.2018.11.440 Culhane et al.
- Borgwardt, F., Robinson, L., Trauner, D., Teixeira, H., Nogueira, A. J. A., Lillebo, A. I., et al. (2019). Exploring variability in environmental impact risk from human activities across aquatic ecosystems. Science of the Total Environment, 652, 1396–1408. http://doi.org/10.1016/j.scitotenv.2018.10.339
- Costea et al. (2018) Assessment of drivers and pressures in the case studies. Deliverable 4.2, European Union's Horizon 2020 Framework Programme for Research and Innovation grant agreement No. 642317. (Deliverable and Executive Summary)
- Teixeira et al. (2018) Assessment of causalities, highlighting results from the application of meta-ecosystem analysis in the case studies. Deliverable 5.2, European Union's Horizon 2020 Framework Programme for Research and Innovation grant agreement No. 642317.(Deliverable and Executive Summary)

Case Study North Sea © RBINS

AQUACROSS has received funding from the European Union's Horizon 2020 Programme for Research, Technological Development and Demonstration under Grant Agreement no. 642317.